

TITLE OF INVENTION

Watercraft Lift Assembly

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable

5 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT

[0002] Not Applicable

BACKGROUND OF THE INVENTION

1. Field of Invention

10 **[0003]** This invention pertains to an apparatus for securing a personal
watercraft to another vessel. More particularly, this invention pertains to rack
assembly adapted to lift and carry the watercraft out of the water. The rack
assembly is attached to another vessel or a platform.

2. Description of the Related Art

15 **[0004]** Personnel watercraft are powered water vessels that carry one or
more persons in a manner similar to riders of a motorcycle where the riders sit
astride the vehicle. Watercraft are typically smaller than traditional water vessels
and are often used with other watercraft, such as houseboats, pontoon boats, or
platform boats.

20 **[0005]** There is a need to secure and transport watercraft during the period
the watercraft are in the water, but not being used. It is known to use a crane or
davit secured to another vessel or dock to hoist or lift a watercraft out of the water.
Such a system, because of the lever arm involved, places high stress at the
connection of the davit to the vessel or dock deck. Further, such a system requires
25 that the davit have a height sufficient to accommodate the height of the watercraft
as it is lifted out of the water. Additionally, it is desirable to be able to secure and
transport watercraft without using valuable deck space on the vessel.

[0006] Several patents disclose various apparatus for storing watercraft or other small water vessels. United States Patent Number 5,603,600, titled "Telescoping Personal Watercraft Jet Track," issued to Egan, et al., on February 18, 1997, discloses an apparatus for loading and unloading a watercraft into a pickup truck bed **50**. The Egan apparatus includes two telescoping ramp members **21, 22** forming a ramp assembly **20** that is connected to a support frame **12** positioned inside the truck bed **50**. The watercraft is positioned on a sled **40**, which is mounted on one telescoping member **22**. A winch system **60** pulls the telescoping members **21, 22** together, and as the center of gravity passes the pivot point **32**, the telescoping members **21, 22** pivot until they are parallel with the upper surface of the support frame **12**. United States Patent Number 6,357,991, titled "Combination Watercraft Transportation System and Dolly," issued to Hamlett on March 19, 2002, discloses another apparatus that includes a rack adapted fit to a pickup truck **T** in which a water vessel is winched onto a rail mechanism **12**. The system **10** includes a pair of pivotal legs **13** and a hand crank **52** for racking the rail mechanism **12** into the truck **T** for transporting the watercraft.

[0007] United States Patent Number 4,274,788, titled "Vehicle Mounted Carriage and Elevating Apparatus," issued to Sutton on June 23, 1981, discloses an assembly **10** for elevating and carrying a small boat on a land vehicle, such as a pickup truck. The apparatus **10** includes a support **20** and a rear post frame **60** mounted to a truck bed **V**, and a carriage **80** with bolsters **92** for supporting a boat. The carriage **80** is lowered into the water and a hook on a cable **93** attached to the winch **98** is secured to the boat. The winch **98** pulls the boat on the carriage **80** out of the water. Another winch **100** connects to a lifting line, or cable, **95** and a plurality of pulleys **27, 45, 25, 90**, and winch **100** is used to rotate link frame **40** about pivot pins **50** from a substantially horizontal position to a vertical position, thereby elevating the boat and shifting the boat over the vehicle.

[0008] United States Patent Number 5,645,007, titled "Personal Watercraft Mooring and Transportation System," issued to Benton on July 8, 1997, discloses a personal watercraft mooring system **10** in which the watercraft **34** is moored to another water vessel. The mooring system **10** includes a receptacle **38** in which the watercraft **34** is driven onto, and the receptacle **38** buoyantly supports the

watercraft **34**. The receptacle **38** is generally V-shaped to accommodate the watercraft **34** as it slides into the receptacle **38** and is nestled therein. The sidewalls of the receptacle **38** confine and provide support to the watercraft **34** when it is partially out of the water. The receptacle **38** is attached to the vessel **12** with a coupling **66**, which can be rigid, include pivots **70**, or includes supports **80** for a vertical displacement mount **82**.

BRIEF SUMMARY OF THE INVENTION

[0009] According to one embodiment of the present invention, a rack assembly adapted to lift and carry a watercraft out of the water is provided. The rack assembly includes a pair of rails adapted to lift and carry a watercraft. The pair of rails rotate about a pivot point to lift the watercraft and position it in a stowed position. A winch with a cable or strap running through a pulley and to the watercraft provides the force necessary to pull the watercraft onto the rack assembly and rotate the pair of rails into the stowed position. In one embodiment, the rack assembly is adapted to mount on a swim platform of a vessel, such as a houseboat. The pair of rails, in one embodiment, have runners for the watercraft to slide against. In another embodiment, each of the rails has a friction strip that prevents the watercraft from sliding along a portion of the rails.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0010] The above-mentioned features of the invention will become more clearly understood from the following detailed description of the invention read together with the drawings in which:

Figure 1 is a perspective view of a boat transom having two rack assemblies attached;

Figure 2 is a side view of one embodiment of a rack assembly with a watercraft being pulled onto the rack assembly;

Figure 3 is a side view of the rack assembly of Figure 2 showing the watercraft in a stowed, out-of-the-water position;

Figure 4 is a plan view of the rack assembly;

Figure 5 is a cross-sectional view of the pivot point of the embodiment of the rack assembly shown in Figure 4;

Figure 6 is a partial cross-sectional view of one rail as shown in Figure 5;
5 and

Figure 7 is a cross-sectional view of one rail and friction strip.

DETAILED DESCRIPTION OF THE INVENTION

[0011] An apparatus for securing a watercraft to another vessel or platform is disclosed. The rack assembly is adapted to lift and carry a watercraft out of the
10 water without the use of davits and cranes and their concomitant vertical cables and spreader bars. The apparatus uses a single winch to pull the watercraft into position and to stow the watercraft.

[0012] Figure 1 illustrates an aft end of a boat **102** with two rack assemblies **10**, **10'** mounted to a swim platform **104**. One rack assembly **10** shows a personal
15 watercraft **108** in the stowed, out-of-the-water position. The other rack assembly **10'** shows the rails **114A**, **114B** partially submerged with the rack assembly **10'** in a loading position ready for a watercraft **108** to be driven onto the rack assembly **10'** for stowing. In the illustrated embodiment, the rack assemblies **10**, **10'** are attached to a swim platform **104**. In another embodiment, the rack assemblies **10**,
20 **10'** are attached to a surface of the vessel **102**, such as a deck, that is near the water surface. In still another embodiment, the rack assemblies **10**, **10'** are attached to a platform, such as a dock, a floating dock, a wharf, or a pier.

[0013] A pair of support arms, or support members, **116A**, **116B** are attached to the swim platform **104**. In the illustrated embodiment, the pair of
25 support arms **116** are connected with a cross-member **126** at their inboard, or forward, end. At the outboard, or aft, end of the support arms **116** is a connection or pivot **206** for the rails **114**.

[0014] The inboard side of the rack assembly **10** has a walkboard, or platform, **112** attached to the rails **114** to aid the watercraft user in mounting and dismounting the watercraft **108**. Depending upon the beam of the vessel **102**, the swim platform **104** can accommodate one or more rack assemblies **10**, **10'** while
5 still having room available for use of the swim platform **104** as a swim platform. In one embodiment, with two rack assemblies **10**, **10'** on a swim platform **104**, the winches **132** have their controls positioned inboard so as to allow an operator to stand between the rack assemblies **10**, **10'**. In one embodiment, the winches **132** are electrically operated. In another embodiment, the winches **132** are hand-
10 operated winches.

[0015] Figure 2 illustrates the rack assembly **10** in position to begin pulling the watercraft **108** out of the water or, alternatively, to release the watercraft **108** to be driven away from the vessel **102**. The rails **114** illustrated in Figure 2 are in a loading position, which is the same position as an unloading position. The
15 loading position is a stable position in which the rails **114** are angled relative to the water such that a watercraft **108** in the water can be driven partially onto the rails **114** until the watercraft **108** engages the friction stops **424** (illustrated in Figure 4). In this position, the operator can disembark the watercraft **108** by stepping on the walkboard **112** and the watercraft **108** is held in a stable position. With the
20 watercraft **108** in this position, the operator can hook to watercraft **108** to the winch cable, or strap, **202**. Figure 3 illustrates the watercraft **108** in the stowed position, out of the water. The stowed position is a stable position in which the rails **114** are secured rigidly with the watercraft **108** out of the water.

[0016] The pair of rails **114** are connected at their inboard end by a cross-
25 piece **124**. Projecting upwards from the cross-piece **124** is an upright arm **118**. The upright arm **118** supports a pulley **218** and a bumper **204** that mates to the bow of the watercraft **108**. The cable **202** extending from the winch **132** passes over the pulley **218** and connects to the watercraft **108** with a hook or other attachment means. In one embodiment, the cable **202** is a rope, either a wire rope
30 or a flexible rope such as one made of nylon or other material, extending from a spool at the winch **132** to a hook or other attachment device. In another embodiment, the cable **202** is a strap, which is a flat, flexible member. In still

another embodiment the cable **202** is a strap adapted to fit within the spool without shifting from side to side. A strap-type cable **202** is suited for not kinking and allows for easy stowing in this application. In one embodiment, the cable **202** is a two-inch wide strap used with a spool having a throat slightly wider than two-inches. The cable (strap) **202** is wound on the spool with each layer on top of a lower layer and the walls of the spool serve to prevent the strap from wandering or shifting from side to side. The end of the cable **202** opposite the winch **132** has a hook or other attachment device for connecting to the watercraft **108**, and when the cable **202** is not attached to a watercraft **108**, it drapes over the rack assembly **10** without automatically coiling or kinking.

[0017] In the illustrated embodiment, the pair of rails **114** are separate members. In another embodiment, the pair of rails **114** are an integral rail member fabricated in one piece. The rail member is adapted to receive the watercraft **108** and rotate about the pivot point **206**. In another embodiment, the rail member includes an integral bumper **204** and the rail member is adapted to cradle the watercraft **108**.

[0018] Referring to Figure 2, when a watercraft **108** is ready to be stowed on the rack assembly **10**, the watercraft **108** is driven onto the rails **114**. A hook at the end of the winch cable **202** is attached to an eye at the bow of the watercraft **108**. The winch cable **202** runs from the winch **132**, through the pulley **218** on the upright arm **118**, and to the hook which is attached to the watercraft **108**. The winch **132** is operated to draw in the cable **202** and slide the watercraft **108** along the rails **114** of the rack assembly **10**. When the bow of the watercraft **108** contacts the bumper **204** on the upright arm **118**, the watercraft **108** is prevented from moving or sliding along the rails **114**, and the rails **114** are rotated about a pivot point **206** as the cable **202** continues to be retracted by the winch **132**, thereby raising the rails **114** and the watercraft **108** out of the water.

[0019] The winch **132** continues to draw in the cable **202** until the rails **114** are positioned as illustrated in Figure 3. In one embodiment, the winch **132** stops when the rails **114** actuate a limit switch indicating that the rails **114** have reached the stowed position. In another embodiment, the winch **132** stops when

the inboard bottom edge of the rails **114** or the cross-piece **124** contacts the swim platform **104**, thereby causing the winch **132** to sense an overload condition and stop. The tension on the cable **202**, in combination with the rails **114** contacting the swim platform **104**, serves to maintain the rails **114** and the watercraft **108** in the stowed position.

[0020] In the illustrated embodiment, the pivot **206** is positioned such that, with the watercraft **108** in the stowed position, a portion of the watercraft **108** weight is forward of the pivot **106**. This weight distribution, in combination with the lever arm of the rails **114** forward of the pivot **206**, minimizes the forces to lift the rails **114** and the watercraft **108** to a stowed position. The slick runners **142** reduce the frictional forces in sliding the watercraft **108** along the rails **114**, further minimizing the force required to move the watercraft **108** in position for stowing.

[0021] Referring to Figure 2, a rail stop **214** on the rails **114** contacts a support stop **216** on the support arms **116A**, **116B**, thereby limiting the drop of the rails **114**. The rail stop **214** in one embodiment, is bar stock welded or otherwise secured to each rail **114A**, **114B**. The corresponding support stop **216** is bar stock welded or otherwise secured to each support arm **116A**, **116B**. As the rails **114** rotate about the pivot **206**, the two stops **214**, **216** move relative to each other. The two stops **214**, **216** make contact when the rails **114** drop into the water and the rails **114** are in the loading position, and the stops **214**, **216** separate when the winch **132** pulls the rails **114** to a stowed position. Those skilled in the art will recognize that either a single set of stops **214**, **216** or a set of stops **214**, **216** on each rail **114A**, **114B** can be used without departing from the spirit and scope of the present invention.

[0022] Figure 4 illustrates a top view of the rack assembly **10**. The two rails **114A**, **114B** are connected at the end nearest the vessel **102** by a cross-member **124**. The opposite end of the rails **114** have a chamfer (visible on Figures 1 to 3) such that the watercraft **108** meets a sloping surface when being driven onto the rack assembly **10**. A portion of the top of each rail **114** is covered with a runner, or skid, **142A**, **142B**, which provides a slick surface for the watercraft **108** to slide

as it enters and leaves the rack assembly **10**. In one embodiment, the runners **142** are formed of a waterproof, mildew resistant, long-lasting, low-maintenance, and low coefficient of friction material. In one embodiment, the runners **142** are formed of ultra-high molecular weight (UHMW) plastic or polymer. In another embodiment, the runners **142** are formed of a Teflon material. In one embodiment, the runners **142** have chamfered or rounded edges.

[0023] Visible in Figure 4 are a pair of friction strips **424A, 424B** positioned approximately midway between the pivot point **206** and the outboard end of the rails **114**. In the illustrated embodiment, these friction strips **424** are approximately two feet long and allow the watercraft **108** to be restrained when the watercraft **108** is positioned at the entry point of the rack assembly **10**. That is, when the watercraft **108** is initially driven onto the rack assembly **10**, the friction strips **424** hold the watercraft **108** in position while the operator disembarks the watercraft **108** and hooks the cable **202** onto the watercraft **108**. When launching the watercraft **108**, the winch **132** lowers the rack assembly **10** and the watercraft **108** slides down the rails **114** until the watercraft **108** is stopped by the friction strips **424**, thereby allowing the operator to remove the cable **202** from the watercraft **108** and mount the watercraft **108**. After mounting the watercraft **108**, the operator can easily shift the watercraft **108** off the rack assembly **10** and maneuver upon the water.

[0024] Attached to the side of rail **114A** is a walkboard, or platform, **112**. In the illustrated embodiment, the platform **112** is attached to both rails **114A, 114B** by members **412A, 412B, 412C, 412D**. In one embodiment, the members **412** are angle welded to the rails **114**. In one embodiment, the platform **112** is formed of a recycled plastic material, which is suitable for a wet environment. In another embodiment, the platform **112** has a textured or grooved surface to increase traction when wet.

[0025] Adjacent to each support arm **116A, 116B** is an upper support angle **416A, 416B** bolted to the swim platform **104**. The upper support angles **416A, 416B** secure the support arms **116A, 116B** to the swim platform **104**. In another

embodiment, the upper support angles **416A, 416B** are fastened to a platform that supports the rack assembly **10**.

[0026] Figure 5 is a cross-sectional view of the pivot **206**. Figure 6 is a close-up view of one end of the pivot **206**. The support arms **116A, 116B** are secured to the swim platform **104** by the upper support angles **416A, 416B** and the lower support angles **516A, 516B**. A fastener **602** passes through the upper support angle **416A, 416B**, through the swim platform **104**, and through the lower support angle **516A, 516B**. In one embodiment, the upper support angles **416A, 416B** are welded to the support arms **116A, 116B**. In another embodiment, such as where the swim platform **104** is an integral part of a fiberglass hull, the support arms **116** and upper support angles **416** are bolted to the fiberglass swim platform **104** in a manner suitable for such a hull construction.

[0027] On the opposite side of the support arm **116A, 116B** from the upper support angle **416** is a spacer plate **612**, which is a flat plate, approximately 1/2 inch thick, that is positioned between the support arms **116A, 116B** and the rails **114A, 114B**. In another embodiment, a bearing sheet, such as a plastic or Teflon sheet, is placed between the spacer plate **612** and the rails **114**. The bearing sheet prevents metal-to-metal contact or rubbing as the rails **114** rotate between the loading position and the stowed position. A hinge pin **502** passes through a hole in the support arms **116A, 116B** and the spacer plate **612**. In the illustrated embodiment, the hinge pin **502** has a cotter pin **604** to prevent the hinge pin **502** from drifting out. Those skilled in the art will recognize that other means of preventing the hinge pin **502** from drifting can be used without departing from the spirit and scope of the present invention.

[0028] Between the support arms **116A, 116B** are the rails **114A, 114B**. Near the lower edge of the rails **114**, on the opposite side as the support arms **116A, 116B**, are side angles **414A, 414B**. In one embodiment, the side angles **414** are welded to the rails **114**. The side angles **414**, seen in plan on Figure 4, extend along a substantial length of the rails **114**, thereby providing rigidity to the rails **114**. The rails **114** and the side angles **414** have openings for accepting the hinge pin **502**. With the support arms **116** fixed to the swim platform **104**, the

rails **114** are free to pivot about the hinge pin **502**. In the illustrated embodiment, the hinge pin **502** bears directly against the edges of the support arms **116**, the rails **114**, the spacer plate **612**, and the side angles **414**. In another embodiment, a bearing is used to allow the rails **114** to rotate about the support arms **116**.

5 **[0029]** In another embodiment, a tube or pipe runs between the two spacer plates **612** with the hinge pin **502** running through the pipe. The pipe is attached to the pair of rails **114** and side angles **414**, and the hinge pin **502** is secured to the support arms **116** such that the hinge pin **502** does not rotate. In this embodiment, as the pair of rails **114** rotates relative to the support arms **116**, the
10 contact between the pipe and the hinge pin **502** is the bearing surface for the pivot **206**. In one embodiment, the pipe is seal welded to the rails **114**, thereby preventing water intrusion to the interior of the rails **114**.

[0030] In another embodiment, the support arms **116** are replaced by support members that include a pivot **206**. In this embodiment, the support
15 members are mounted to a platform, such as the swim platform **104**, with the pivot **206** located at the edge of the platform. In other embodiments, the pivot **206** is located either inboard or outboard of the platform edge. In these embodiments, the pivot **206** is located at such a height that the inboard end of the rails **114** is slightly lower than the outboard, or aft, end of the rails **114** when the rails **114** are
20 in the stowed position.

[0031] The spacer plate **612** between the support arms **116** and the rails **114** provides room for the rail stop **214** and the support stop **216** to move with their corresponding support arm **116** or rail **114**. In one embodiment, the stops **214**, **216** are 1/2 x 1/2 aluminum bar stock welded to the support arms **116** and
25 rails **114**, and the spacer plate **612** is 1/2 inch thick plating. In this manner, the spacer plate maintains a gap between the support arm **116** and the rail **114**, and the stops **214**, **216** are free to rotate about the pivot **206** without binding against the adjacent support arm **116** or rail **114**. In another embodiment, a bearing sheet is disposed between the spacer plate **612** and the rails **114**, and the bearing sheet
30 provides additional clearance for the stops **214**, **216** and also prevents metal-to-metal contact between the spacer plate **612** and the rails **114**.

[0032] Seen in cross-section atop the rails **114** are the runners, or skids, **142**. The runners **142** provide a bearing surface for the watercraft **108** to slide against as the watercraft **108** is positioned on the rails **114**. In one embodiment, the runners **142** are secured to the rails **114** with fasteners.

5 [0033] Figure 7 illustrates a cross-section of the rail **114A** and its associated friction strip **424A**. In the illustrated embodiment, the friction strip **424** is a section of dock bumper that is fastened to the rails **114**. Figure 7 shows the friction strip **424** in its natural shape positioned along the inside surface of the rail **114** and atop the runner **142A**. In the illustrated embodiment, a bolt **702** extends
10 through the friction strip **424** and through the rail **114**. The protruding end of the bolt **702** is secured with a nut **704**. The head of the bolt **702** is not visible in Figure 7 because the bolt **702** is not shown intersecting the cross-sectional plane, but is shown some distance beyond the cross-sectional plane. The friction strip **424** is compressed by the bolt **702** where the strip **424** is fastened to the rail **114**.
15 Those skilled in the art will recognize that other means besides a bolt **702** and nut **704** can be used to secure the friction strip **424** to the rails **114** without departing from the spirit and scope of the present invention.

[0034] The rack assembly **10** includes various functions. The function of holding a watercraft **108** is implemented, in one embodiment, by the pair of rails
20 **114** that are adapted to cradle the watercraft **108**. In another embodiment, the function further includes a runner **142** attached to each rail **114**. In still another embodiment, the function further includes a bumper **204** adapted to mate with the bow of the watercraft **108**. In yet another embodiment, the function further includes at least one friction strip **424** attached to at least one rail **114**.

25 [0035] The function of securing the pair of rails **114** in a loading position is implemented, in one embodiment, by at least one rail stop **214** contacting at least one support stop **216** as the rails **114** rotate about the pivot point **206**. As the rails **114** rotate into the loading position, the stops **214**, **216** approach each other until they contact, at which time the rails **114** reach the loading position and the
30 rails **114** stop rotating.

[0036] The function of pulling the watercraft **108** onto the pair of rails **114** is implemented, in one embodiment, by the winch **132** retracting the cable **202** attached to the watercraft **108**, thereby causing the watercraft **108** to slide along the rails **114**. In another embodiment, the runners **142** attached to the rails **114** assist the watercraft **108** in sliding along the rails **114**.

[0037] The function of moving the pair of rails **114** from a loading position into a stowed position is implemented, in one embodiment, by the winch **132** retracting the cable **202** attached to the watercraft **108** with the watercraft **108** against the bumper **204**, thereby causing the pair of rails **114**, with the watercraft **108** on them, to rotate about the pivot point **206**.

[0038] The function of accessing the watercraft is implemented, in one embodiment, by a walkway **112** attached to at least one of the pair of rails **114**. The walkway **112** is adjacent the watercraft **108** on the pair of rails **114** and allows a person to stand next to the watercraft **108** in addition to providing a place for a person exiting or entering the watercraft **108** to place a foot.

[0039] From the foregoing description, it will be recognized by those skilled in the art that a rack assembly **10** adapted to lift and carry a watercraft **108** out of the water has been provided. The rack assembly **10** includes a pair of rails **114** for supporting the watercraft **108**. The pair of rails **114** pivot relative to a pair of support arms **116** whereby the watercraft **108** is winched aboard the pair of rails **114** and the pair of rails **114** are pivoted out of the water into a stowed position. The rack assembly **10** presents a low silhouette suitable for houseboats and other pleasure craft, in addition to floating docks and piers. Further, the rack assembly **10** permits an easy method for pulling the watercraft **108** onto the rack assembly **10** and for rotating the rails **114** into a stowed position. The rack assembly **10** requires the use of only a single winch **132** to pull the watercraft **108** onto the rails **114** and to position the rails **114** in a stowed position.

[0040] While the present invention has been illustrated by description of several embodiments and while the illustrative embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages

and modifications will readily appear to those skilled in the art. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described.

Accordingly, departures may be made from such details without departing from the
5 spirit or scope of applicant's general inventive concept.